

UK Patent Application (19) GB (11) 2 164 220 A

(43) Application published 12 Mar 1986

(21) Application No 8519989

(22) Date of filing 8 Aug 1985

(30) Priority data

(31) 8422282 (32) 4 Sep 1984 (33) GB

(51) INT CL⁴
H03H 9/02

(52) Domestic classification
H3U 22 TE

(56) Documents cited

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(58) Field of search
H3U

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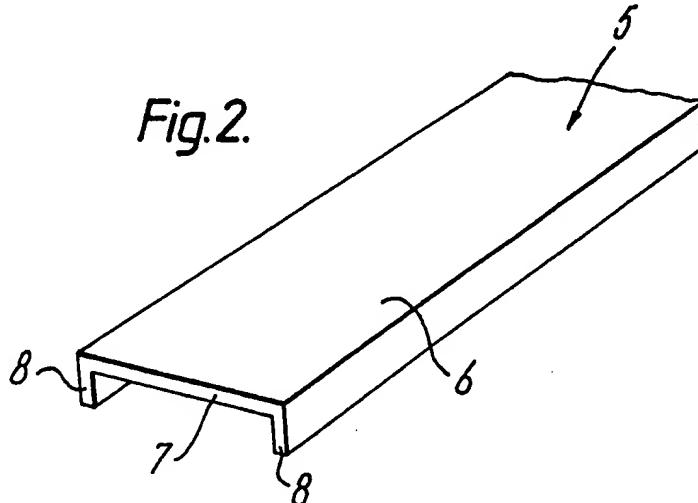
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(54) Ultrasonic waveguide

(57) Ultrasonic Lamb waves are transmitted along a waveguide 5 comprising a strip of metal 7 extending in the direction of propagation, and elements 8 along the edges of the strip to inhibit wave motion adjacent to the edges. The inhibiting elements may be integral with, and projecting from, the strip so as to define a waveguide of rectangular channel section.

Alternatively, a bead (3, Fig. 1) of epoxy resin may be provided along each edge instead of elements 8.

Fig. 2.



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Fig.1.

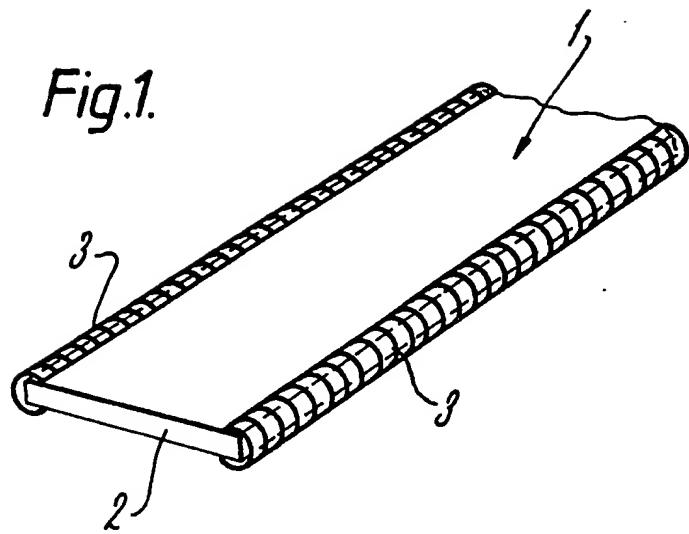
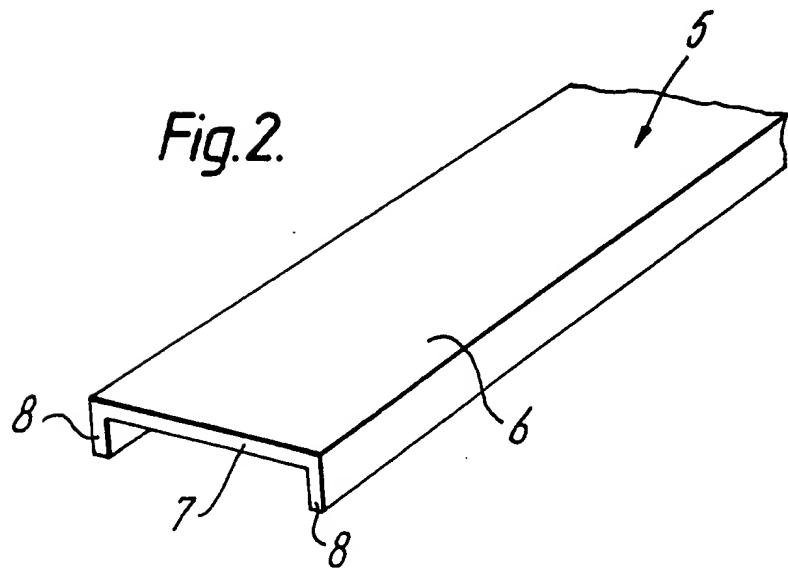


Fig.2.



SPECIFICATION
Waveguide

This invention relates to a waveguide for ultrasonic waves.

- 5 The use of a flat metal strip to transmit ultrasonic waves is known from UK Patent No. 2 092 408B and UK Patent Appln. No. 2 137 348A. Lamb waves will propagate along such a strip, and it has been found that the mode of propagation is not significantly different from that in a very wide strip, even if the strip is only 25 mm wide. A Lamb wave is an acoustic wave in which the wavelength of the wave is comparable with the thickness of the body in which it is travelling. By the term strip is meant a piece of a material whose thickness is much less than its breadth.
- 10 According to the present invention there is provided a method of transmitting ultrasonic waves wherein the waves are arranged to propagate along a waveguide comprising a strip portion extending in the direction of propagation, and means along the edges thereof for inhibiting coherent wave motion at the edges. Preferably the inhibiting means comprises edge portions integral with the strip portion, extending along each edge of the strip portion, and projecting from the face of the strip portion.
- 15 Both the edge portions may project from the same face of the strip portion, so defining a channel-shaped waveguide. Alternatively the edge portions may project from both faces of strip portion, so defining an I-section shaped waveguide.
- 20 The bounding edges of the known form of strip waveguide are a source of reflections and consequently of constructive and destructive interference. This may be overcome according to the invention by a layer of absorbing material applied along the strip edges, which collimates the transmission and so enforces plane wave propagation. This may lead, however, to considerable power loss if the strip is narrow. For example the absorbing material might be applied in a 3 mm wide band along both edges of a strip, on both faces of the strip; if the strip were 10 mm wide
- 25 there would only be 4 mm width of guide along which propagation could occur.

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- 40 there would only be 4 mm width of guide along which propagation could occur.
- 45 The use of a channel or I-section shaped waveguide has a marked effect on wave propagation, as coherent wave motion at the edges of the strip portion is inhibited. Such a waveguide is relatively inflexible due to the edge portions, and the use of narrow wave-guides is made feasible.
- 50 The invention will now be described by way of

example only and with reference to the accompanying drawings, in which:

- 55 Figure 1 shows a perspective view of a waveguide and
- 60 Figure 2 shows a perspective view of an alternative waveguide.
- 65 Referring to Figure 1, a waveguide 1 for 1 mHz Lamb waves comprises a stainless steel strip 2 of width 20 mm and thickness 1.5 mm. Along each edge is a bead 3 of Araldite (R.T.M.) epoxy resin which extends 2 mm onto each face of the strip 1.
- 70 Referring now to Figure 2, an alternative waveguide 5 comprises a stainless steel rectangular channel member 6, of thickness 1.5 mm. The member 6 consists of a strip portion 7 of width 20 mm, along which 1 MHz Lamb waves may propagate, and opposed wall portions 8 along each edge of the strip portion 7, each wall being 3 mm high.
- 75 In use of the waveguide 1 or 5, a piezo-electric or electro-magnetic generator (not shown) of Lamb waves is coupled to one end of the strip 2 or the strip portion 7 respectively, and the generator is excited so as to cause Lamb waves with a frequency of about 1 MHz to propagate along the waveguide 1 or 5.

80 CLAIMS

1. A method of transmitting ultrasonic waves wherein the waves are arranged to propagate along a waveguide comprising, a strip portion extending in the direction of propagation, and means along the edges thereof for inhibiting coherent wave motion at the edges.
2. A method as claimed in Claim 1 wherein the inhibiting means comprises a layer of absorbing material along the edges of the strip.
3. A method as claimed in Claim 1 wherein the inhibiting means comprises edge portions integral with the strip portion, extending along each edge of the strip portion, and projecting from the face of the strip portion.
4. A method as claimed in Claim 3 wherein both the edge portions project from the same face of the strip portion, so defining a channel-shaped waveguide.
5. A method as claimed in Claim 3 wherein the edge portions project from both faces of strip portion, so defining an I-section shaped waveguide.
- 100 6. A method of transmitting ultrasonic waves wherein the waves are arranged to propagate along a waveguide substantially as hereinbefore described with reference to and as shown in, Figure 1 or Figure 2 of the accompanying drawings.